RAINFALL AND GRAZING.

According to Mr. A. B. Wollaber, in the January Report of the Oregon Section, a careful estimate has been made in Australia on the relation of rainfall to the number of sheep capable of obtaining sustenance on a square mile of semiarid land. Up to a rainfall of 10 inches per annum, as many sheep can thrive on a square mile as there are inches of rainfall. When the rainfall is above 10 inches the ratio rapidly increases so that twenty sheep per square mile can be supported when the rainfall is 13 inches per annum and about seventy sheep when the rainfall is 20 inches per annum.

THE FIRST NUMBER OF THE MONTHLY WEATHER REVIEW.

Some bibliographers may have noticed in the list of Weather Bureau publications a statement to the effect that MONTHLY WEATHER REVIEWS have been published since July, 1872. The more precise statement is that the publication began with the REVIEW for 1873, since which time it has appeared regularly and been very widely distributed. The first copy and the initial steps toward the regular publication were taken by the present Editor, but subsequent numbers were prepared by various officials, alternately. The general rule was that the forecast official for the month prepared the REVIEW for that month, but, of course, as a variety of duties multiplied and the scope of the REVIEW increased, the work of the editor was often limited to a very general supervision of the work done by the clerks of the REVIEW room; the personality of the editor did not enter into the REVIEW quite as clearly as it has done during the past few years.

When the Annual Report for the fiscal year ending June 30, 1873, was being prepared (and such work was always done by one of the assistants of the Chief Signal Officer) it was considered desirable to insert a reprint of the MONTHLY WEATHER REVIEWS for the six months, January-June, and also similar REVIEWS for the preceding six months. These latter were prepared by Mr. Calver, who was the clerk in charge of the Farmers Weekly Bulletin. Three of them, viz., those for October, November, and December were completed in time for publication in the Annual Report; those for the three months, July, August, and September, 1872, were filed as manuscripts and remained unprinted until 1888, when they were printed for the purpose of binding up a few sets of the MONTHLY WEATHER REVIEW, for use in the Central Office and at the larger stations. It is, therefore, proper to say that the regular publication of the MONTHLY WEATHER REVIEW began with the number for January, 1873, and that the earlier numbers were written up and printed subsequently.

BOMBARDMENT OF HAILSTORMS.

In reply to a query from the editor of the American Agriculturist, the Chief of Bureau has lately sent the following reply, which embodies the present state of our knowledge as to the value of cannonading as a means of preventing hail. This extract is printed for the general information of others:

You ask whether the Department of Agriculture is planning to make any test of the French method of bombarding the clouds to prevent hailstorms; if so, when and where and how many? What do you think of this idea, any way?

The method you speak of is undoubtedly based upon popular delusions, and has spread throughout Italy, southern Austria, and southern France. It is practised by the owners of vineyards, and is especially exploited by the firm of Greinitz, Neffen, manufacturers of iron works, Gratz, Austria. The inventor of the apparatus is Mr. Stiger, and the method is ordinarily spoken of as the Stiger method. It consists essentially in sending vortex rings of smoke and air upward toward the clouds; but the most powerful Stiger cannon that have yet been employed do not send these rings higher than 1,200 feet above the ground, and, therefore, utterly fail to reach the clouds. On this account the distinguished Austrian meteorologist, J. M. Pernter, has maintained that if there is any virtue whatever in the idea, the experimenters must use much more powerful apparatus. But there is no satisfactory evidence that the cannonading or the vortices had any influence whatever on the hail. Both theory and practise agree in this conclusion. Theoretically it was imagined by Mr. Stiger that hail is formed in quiet spots in the atmosphere where the atmospheric moisture could crystallize out in large crystals in a manner analogous to the formation of large crystals of salt in liquid solution. But this is a very foolish notion: there are no such quiet spots in the atmosphere, and hailstones are not crystals but masses of ice, with only a feeble or partial crystalline structure. Even the perfect crystals of the snowflakes are formed in the midst of rapidly-moving air, so that the whole theoretical basis for hailstorm cannonading falls to the ground.

It is generally difficult to prove that a specific fall of hail has been especially influenced by the cannonading. Hailstorms are generally very local and erratic; some have maintained that they are controlled by the hills and contour of the ground or by the presence of forests and lakes, but practically the whole question is one of the ascending and descending currents of air that characterize whirlwinds and thunderstorms. If in the midst of these complex motions with the resulting rain there occur here and there patches of hail, it would seem absurd to say that we can put our finger upon the precise influence that caused or prevented hail. If in the midst of a hailstorm I fire off a cannon and the hail ceases to fall on my land but continues to fall on my neighbor's, it would be folly in me to maintain that this is due to the firing of my gun. Nothing but the continued repetition of this phenomenon, under a variety of circumstances, would justify such conclusions. Now, the fact is that in the various reports relative to hail shooting there has not been a fair presentation of the statistics of the results. Nothing is told us as to where the hailstorms come from or go to, nor even whether there were any hailstorms, but in most cases the record simply says that a threatening cloud was seen approaching, the cannonade began and continued until the cloud went away, and no hail fell on the region supposed to be protected by the cannon. But this is not all, the last congress on the bombardment of hail utterly refused to entertain reports from those who testified that the hail fell in spite of the cannonade. In fact, therefore, reports showing that in no case was the cannonading of any avail had to be published independently.

After examining all that has been published during the past two years, my conviction is that we have here to do with a popular delusion as remarkable as is the belief in the effect of the moon on the weather. The uneducated peasantry of Europe seem to be looking for something miraculous. They would rather believe in cannonading as a means of protection and spend on it abundance of money, time, and labor, than adopt the very simple expedient of mutual insurance against the losses that must inevitably occur.

After the experience this country has had during the past ten years to believe that the bombardment of hailstorms will ever be practised, or even attempted in the United States, much less encouraged by the with such rain-makers as Dyrenforth, Melbourne, and others, I am loath intelligent portion of the community. Every effort should be made to counteract the spread of the Italian delusion. which seems to have been imported into this country by the unfortunate publication of the reports of the United States consul at Lyon, France.

I trust that the columns of the American Agriculturist will discuss the subject with sufficient fulness to enable the farmers to see that the great processes going on in the atmosphere are conducted on too large a scale to warrant any man or nation in attempting to control them. The energy expended by nature in the production of a hailstorm, a tornado, or a rain storm, exceeds the combined energy of all the steam engines and explosives in the world. It is useless for mankind to combat nature on this scale. Fortunately, the destruction by hail, lightning, floods, etc., is usually confined to small regions.

SAND DUNES AND THE WIND.

The piles of light sand along the coasts of the oceans and lakes are frequently driven forward by the wind, forming so-called dunes, which are in continual motion, traveling as fast as the wind can carry up the sand on the windward side and deposit it on the leeward side of the mound. This perpetual renewal of the windward and leeward surfaces prevents the growth of vegetation quite independently of the extreme dryness of the sand. Such dunes, either of sand or fine soil, have been encroaching on the Valley of the Nile from time